

TETHYS ENGINEERING BLAST



6 May 2022

Tethys Engineering is an online knowledge hub that facilitates the exchange and dissemination of information on the technical and engineering aspects of marine energy. The bi-weekly *Tethys Engineering Blast* highlights new publications in the [Tethys Engineering Knowledge Base](#); relevant announcements, opportunities, and upcoming events; and news articles of international interest. Email tethys@pnnl.gov to contribute!

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Announcements

Tethys Engineering Survey

As part of the international community working to advance the marine energy industry, we would like to hear from you! We ask that you please fill out a brief, 3-minute [survey](#) by 27 May 2022 to help us evaluate and guide further development of *Tethys Engineering*.

MHKDR Survey

The *Marine and Hydrokinetic Data Repository (MHKDR)* team is also conducting a brief, 3-minute [survey](#) to help evaluate and guide further development of the *MHKDR*. Please respond to the survey by 27 May 2022.

New Version of WEC-Sim Released

Sandia National Laboratories and the National Renewable Energy Laboratory recently released [WEC-Sim \(Wave Energy Converter SIMulator\) v5.0](#), an open-source code for simulating wave energy converters. Funded by the US Department of Energy (DOE)'s Water Power Technologies Office, WEC-Sim was developed in MATLAB/SIMULINK and is publicly available on GitHub. More information can be found on the software's [online documentation](#).

Marine Energy Collegiate Competition

The US DOE has opened the application period for the [2023 Marine Energy Collegiate Competition](#), which challenges interdisciplinary teams of undergraduate and graduate students to offer unique solutions to the marine energy industry that can play a role in powering the blue economy. Applications are due 8 May 2022.

Calls for Abstracts

The [Call for Abstracts](#) for the [37th International Conference on Coastal Engineering \(ICCE\)](#) is now open until 6 May 2022. ICCE will take place on 4-9 December 2022 in Sydney, Australia.

The [Call for Abstracts](#) for Structures in the Marine Environment (SIME 2022) is now open until 6 May 2022. SIME 2022 will take place on 7 June 2022 in Edinburgh, Scotland.

The Call for Abstracts for the [University Marine Energy Research Community \(UMERC\) and Marine Energy Technology Symposium \(METS\) joint conference](#) has been extended to 16 May 2022. UMERC and METS will host the event on 13-14 September 2022 in Portland, US, in conjunction with the [Ocean Renewable Energy Conference \(OREC\)](#) on 14-15 September 2022.

The [Call for Abstracts](#) for [OCEANS 2022 Hampton Roads](#) is open through 16 May 2022. The hybrid event will take place on 17-21 October 2022 in Virginia Beach, US and online.

The [Call for Abstracts](#) for the [International Conference on the Environmental Interactions of Marine Renewables \(EIMR 2022\)](#) is now open until 16 May 2022. The University of the Highlands and Islands and Heriot Watt University will host EIMR online on 4-6 October 2022.

Funding & Testing Opportunities

The UK Department for Business, Energy & Industrial Strategy has launched Phase 9 of the [Energy Entrepreneurs Fund](#), which aims to support the development and demonstration of green energy technologies. Applications are due 11 May 2022.

The Centre for Advanced Sustainable Energy (CASE), an industry led, collaborative, sustainable energy research centre hosted at Queen's University Belfast, is seeking applications from suitably qualified consortia for research and development funding to support the decarbonisation of the energy system. The [Call for CASE Project Applications](#) closes 13 May 2022.

The Sustainable Energy Authority of Ireland National Energy [Research Development and Demonstration \(RD&D\) Funding Call](#) is now open for applications from eligible organizations based in Ireland. Applications are due 16 May 2022.

The French Government's Ministry of the Sea has launched the Maritime Intervention Fund's second [Call for Applications](#) to support the sustainable development of maritime activities, including coastal and blue economy development. Applications are due 31 May 2022.

The Interreg Europe programme, financed by the European Regional Development Fund, has launched its first [Call for Proposals](#) in the 2021-2027 period, and is looking for interregional cooperation projects that will support a greener Europe. Applications are due 31 May 2022.

The Interreg North-West Europe Programme has launched its first [Call for Projects](#) in the 2021-2027 period, and is looking for transnational cooperation initiatives that can deliver concrete results for the North-West Europe area. The Call for Projects will close on 15 June 2022.

The European Commission is launching the Innovation Fund's second [Call for Small Scale Projects](#) in renewable energy, energy-intensive industries including substitute products, energy storage, and carbon capture, use and storage. Applications are due 31 August 2022.

Student & Employment Opportunities

The National University of Ireland Galway is accepting applications for [5 PhD research positions](#) available through the TIDAL-GES (Tidal Energy – A transition to affordable and clean energy that can achieve ‘Good Environmental Status’ in coastal and marine waters) project. Applications are due 9 May 2022.

Eco Wave Power is seeking a Projects Manager, Marketing Manager/Marketing Communications Manager, and a Senior Business Development Associate. Learn more [here](#).

Floating Power Plant A/S is looking for a [Hydrodynamicist/WEC Numerical Modeler](#), with expertise in Matlab, Simulink, and Wave Energy Convertors (WEC), to join its team.

Upcoming Events

Upcoming Summit

The Australian Ocean Energy Group is hosting the [Australian Ocean Energy Market Summit](#) on 10-11 May 2022 in Hobart, Australia and online. The event aims to create information-based connections between Australian market representatives and industry leaders. Register [here](#).

Upcoming Workshops

UMERC is hosting a workshop, [Power for Ocean Sensing: Creating Dialogue around Power Capabilities and Needs](#), from 10:00am-12:00pm PDT (5:00-7:00pm UTC) on 19 May 2022. During this workshop, marine energy developers will update oceanographers on new power technology development and discuss how to support big data in the ocean. Register for free [here](#).

As part of [European Maritime Day 2022](#), Mercator Ocean International, the European Investment Bank, and the Croatian Chamber of Economy are hosting a hybrid workshop, "[Ocean Technologies, Services and Financial Instruments](#)", on 20 May 2022 from 10:45-11:45am CEST (8:45-9:45am UTC) in Ravenna, Italy and online. Register [here](#) by 12 May 2022.

Upcoming Conferences

The Dutch Marine Energy Centre (DMEC) is hosting its [Marine Energy Accelerator Conference](#) on 2 June 2022 in The Hague, Netherlands and online. Register [here](#).

The Pan American Marine Energy Association is hosting the [Pan American Marine Energy Conference \(PAMEC 2022\)](#) on 19-22 June 2022 in Ensenada, Mexico, with workshops on 17-18 June 2022. Register [here](#).

New Documents on *Tethys Engineering*

[Manufacturability considerations in design optimisation of wave energy converters](#) – Garcia-Teruel & Forehand 2022

Wave energy converter hull shapes have been optimised in the past to find the most suitable design to maximise mean annual power production and minimise costs. However, costs are generally considered through proxies based on the device's size. When using an optimisation process capable of generating very diverse shapes, more complex objective functions may be required to ensure that resulting shapes truly minimise the levelised cost of energy. For this purpose, relevant cost factors with an effect on geometry, such as manufacturability and materials considerations, should be included in the optimisation process. To address this challenge, different strategies for incorporating manufacturability considerations in a wave energy converter optimisation process with an adaptable geometry definition are discussed here.

[Research on the tandem arrangement of the ducted horizontal-axis tidal turbine](#) – Feng et al. 2022

Array research of tidal turbine is critical to make it cost-effective and commercializing. There are many studies of turbine arrays, which mostly focus on a conventional horizontal-axis turbine. While a ducted turbine is also available for commercial application, which draws little attention. In this paper, the tandem arrangement of ducted horizontal-axis turbines is studied based on the flume experiment and the large eddy simulation (LES). The turbine's performance changes are investigated under the 5-15D (D represents the turbine diameter) tandem distance. Research results show that the downstream turbine's performance degrades significantly, and its efficiency drops to roughly half of the upstream turbine when the tandem distance is 5-10D.

[Performance improvement of ocean thermal energy conversion organic Rankine cycle under temperature glide effect](#) – Zhang et al. 2022

The temperature glide effect of zeotropic mixtures on ocean thermal energy conversion (OTEC) cycle driven by a narrow temperature difference, which is significantly different from that in conventional low-grade energy technologies, is yet to be thoroughly studied. In this study, the binary zeotropic mixtures-based OTEC cycle is investigated.

Comparative analysis of the classical zeotropic organic Rankine cycle (ORC) and six types of zeotropic ORCs configured with or without series/parallel multi-pressure evaporators and single-/dual-outlet liquid-separated condensers were conducted. The results showed that zeotropic mixtures could be beneficial in ocean thermal energy conversion.

[A Critical Review of Power Take-Off Wave Energy Technology Leading to the Conceptual Design of a Novel Wave-Plus-Photon Energy Harvester for Island/Coastal Communities' Energy Needs](#) – Prasad et al. 2022

Hybrid renewable energy innovations are gaining progressive interest not only because of the threat of climate change but also due to the technological advancements seen in renewables. Ocean waves have immense potential as a renewable energy source, and related technologies have advanced continuously over the past few decades. In response, this paper extensively studies wave energy converters (WECs) based on the power take-off (PTO) technique, and presents a novel hybrid wave-plus-photon energy (HWPE) harvester called Wavevoltaics, based on wave and solar energy capture systems for coastal communities' power needs, in line with decarbonization measures.

[Hydrodynamic Analysis of Tidal Current Turbine under Water-Sediment Conditions](#) – Gao et al. 2022

The rivers connecting oceans generally carry sediment due to water and soil losses in China. Additionally, the maximum sediment concentration is 300 g/L, which is much higher than that of other countries. It is unknown whether seawater with sand particles will affect the power of tidal current turbine blades. It is therefore necessary to study the capture power of tidal current turbines in the water-sediment environment. In this study, the blade was divided into a number of transversal airfoil elements based on the blade element theory. The Computational Fluid Dynamics-Discrete Phase Model (CFD-DPM) was employed to study the lift and drag coefficients of airfoil under multiphase flow, and the fluid-particle interaction was considered.

[An electrochemical system for salinity gradient energy harvesting](#) – Zhou et al. 2022

Salinity gradient energy, which is abundant along the coastline in ocean, is a kind of chemical energy existing the solutions of different concentrations mixing. The pressure retarded osmosis, reverse electrodialysis and accumulator mixing technology are currently the most common approaches to harvest salinity gradient energy. Here we report an electrochemical device using active carbon as anode and manganese phosphate as cathode for salinity gradient energy harvesting, which shows an energy density of 5.31 J g^{-1} , indicating a potential application in the field of ocean energy utilization.

News & Press Releases

Sabella reinstalls D10 tidal turbine for third test campaign offshore France – Offshore Energy

French company Sabella has reinstalled its 1MW tidal energy turbine off Ushant Island in France for a new long-term test campaign. The campaign, which will supply Ushant Island with green electricity, aims to prepare the PHARES project to supply the island with a range of renewable energies. Deployed in the Fromveur Passage, the cable connecting the 1MW tidal energy turbine to land-based infrastructure was also replaced with new equipment. The successful reinstallation enabled the validation of a new connection system, completely redesigned in 2021. In addition, a new system for balancing electricity production on land will also be tested in full scale during this campaign. The export of electricity to the island's power grid will take place gradually, in coordination with ENEDIS, while the standard production will start within a few weeks.

Cutting edge research facility aims to accelerate the development of offshore renewable innovations – Offshore Renewable Energy (ORE) Catapult

Two of the UK's leading organisations spearheading the offshore renewable energy revolution are partnering to increase industry access to facilities and expertise that will fast-forward the development and deployment of new offshore renewables products and services. The University of Plymouth and the ORE Catapult have agreed to establish a new Collaborative Offshore Renewable Energy Subsea Systems (COSS) research accelerator. Hosted within the University's Marine Building, the COSS will enhance the UK's position as a global leader in offshore renewables by tackling some of the key engineering challenges to accelerating the roll-out of new technologies. The new facility will be focused around the hydrodynamics of floating offshore structures, offshore engineering and control systems.

Carnegie's wave power spin-off for aquaculture sector nears design completion – Offshore Energy

Carnegie Clean Energy has made headway on the development of the MoorPower project, with the design of CETO wave energy device spin-off – aimed at aquaculture sector – nearing completion. The preliminary commercial-scale MoorPower technology design is nearing completion as part of the \$2.4 million project. Progressing both the commercial-scale design and the scaled demonstrator design will ensure that the scaled demonstrator deployed in North Fremantle in Australia meets the requirements and objectives of Carnegie's commercial customers. The MoorPower technology is a CETO-derived wave energy product designed for moored vessels, offering a solution to the challenge of securing clean and reliable energy for offshore activities and reducing the reliance on diesel generation.

Ocean Harvesting completes testing of InfinityWEC power take-off and control system in a scale 1:10 test rig – Ocean Harvesting

Ocean Harvesting has successfully completed the testing of a prototype in scale 1:10 of the power take-off (PTO) and the control system for the wave energy converter InfinityWEC. The design, build and testing in the rig was part of a project co-financed by the Swedish Energy Agency. To obtain a realistic load on the machinery, a scaled hydrodynamic model of a full-size wave energy converter was used in combination with the physical PTO prototype and a real-time control system in a hardware-in-the-loop (HIL) configuration. A control system has been developed for both the PTO and the HIL rig, which in combination with the physical representation of the PTO, with all essential functionality included, demonstrates that the technology works as intended.

SBS completes feasibility study for tidal energy project in Indonesia – Offshore Energy

UK-based tidal energy project developer SBS has completed the feasibility study for a planned megawatt-scale tidal energy project in the Larantuka Strait in Indonesia. A final report analyzing the suitability of tidal energy resources in Larantuka Strait to drive MW-scale tidal turbines was submitted for review to state-owned electrical plant and power-transmission company Indonesia Power (IP), and electrical offtaker Perusahaan Listrik Negara (PLN). The tidal energy project in the strait has the potential for providing clean, sustainable, renewable electricity to the communities of East Flores and Adonara. Under a fully-executed, joint-participating agreement between the parties, formalized in November 2021, IP provided an IEC-compliant primary data tidal resource survey activity, while SBS delivered a 220-page main feasibility study report, which included a copy of the survey activity report and raw data analysis report.